# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/777,120 | 02/05/2001 | Arie E. Kaufman | AP30612-C-072600.0171 | 2426 |

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BAKER & BOTTS
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

| EXAMINER |
|---|
| AZARIAN, SEYED H |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2625 | |

DATE MAILED: 08/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 09/777,120 | KAUFMAN ET AL. |
| | Examiner | Art Unit | |
| | Seyed Azarian | 2625 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on <u>23 May 2005</u>.

2a)☒ This action is **FINAL**.      2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) <u>51-59 and 62-72</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>51-59 and 62-72</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>05 February 2001</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

## RESPONSE TO AMENDMENT

1.      Applicant's amendment filed, 5/23/2005, see page 9 through page 11of the remarks, with

respect to the rejection of claims 51-59 and 62-72 have been fully considered but they are not

persuasive in view of the new grounds of rejection necessitated by applicant's amendment.

2.      Applicant argues in essence regarding claim 51Vining fails to teach, "**use of textural**

**surface feature**".

Contrary to the applicant's assertion, Vining discloses a **surface** rendering of an organ can

be incorporated into a volume rendering of the surrounding anatomy using **texture** memory in

order to achieve a combined surface/volume rendering, or hybrid rendering effect, wherein the

surface rendered organ may be highlighted in the context of the volume-rendered surrounding

anatomy, also such as three dimensional **surface rendering**, of the selected object and to

automatically identify potentially **abnormal region of the structure** (column 4, lines 5-39).

Further a characteristic indicating abnormal wall structure is affected by determining a

normal vertex for each vertex position of wire frame model. A **wall thickness** value associated

with each normal vector is determined for each vertex. Local convexity and curvature are also

determined on a per vertex basis, then contiguous vertices having a characteristic **indicating**

**abnormal thicknesses or other abnormal properties** (column 2, lines 31-54).

In response to applicant's argument, essence that there is no teaching to "**smooth surface,**

**a rough surface** ", as indicated by Vining, clearly state the following features: a thin-walled **soft**

**tissue (smooth)** structure is relatively distinct and sharp. Further, the outside surface of the air

column corresponds to the inside surface of the organ of interest (column 5, lines 40-60), also

column 8, line 58 through column 9, line 13, refer to **non-soft tissue (rough)**.

Finally, in response to applicant's arguments that Greensite does not disclose "**a**

**probability density function**". Greensite in the same field of medical imaging teaches the

**distance between two voxels** dependent on the difference in probability, the probability density

of random in this region and the higher gray value assigned to this particular subset of voxels,

further probability density of the voxel forming the sub region of interest is identical for two sub

region (column 15, lines 36 through column 16, line 9).

Therefore it would have been obvious to one having ordinary skill in the art at the time of

the invention was made, to modify Vining et al invention according to the teaching of Greensite

because it provides a tone value to each of the plurality of voxels corresponding to the value of

the density function for each of the voxels and displaying each voxel represented by a pixel with

assigned tone value, which can easily be implemented in an image device such as X-ray or CT

device.

# Claim Rejections - 35 USC § 102

3.     The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.　　Claims 51, 59, 62 and 70-72, are rejected under 35 U.S.C. 102(b) as being anticipated by Vining et al (U.S. patent 5,920,319).

Regarding claim 51, Vining et al discloses a method of performing computed assisted diagnosis of a region of interest, comprising (Fig. 1, column 5, lines 3-11, region of interest);

acquiring imaging scan data including at least a portion of the region of interest (column 2, lines 55-66, images acquired by scanner to select region of interest);

converting the imaging scan data to a volume representation including a plurality of voxels, at least a portion of the voxels representing a surface of the region of interest, analyzing said portion of voxels representing a surface to determine a context surface texture feature of the region of interest (column 6, lines 24-35, the voxels or volume of the segment region of interest are tagged and column 10, lines 56-65, identifies abnormal thickness and curvature);

analyzing said portion of voxels representing a surface to identify a local surface texture feature, different from the context texture feature, which is indicative of an abnormality (column 2, lines 31-54, a characteristic indicating abnormal wall structure is effected by determining a normal vertex for each vertex position of wire frame model. A wall thickness value associated with each normal vector is determined for each vertex. Local convexity and curvature are also determined on a per vertex basis, then contiguous vertices having a characteristic indicating abnormal thicknesses or other abnormal properties, also column 11, line 51 through column 12, line 17, Fig. 5, the convexity is a measure of the direction and magnitude of the shape of the surface of the population, when the structure is a colon populations with a negative convexity value are excluded from being considered abnormal. Further, only populations having a positive convexity value above a minimum value are reasonably expected to be potential lesions

(abnormal texture), since cancerous colon masses are generally manifested by steeply sloped

growths, also the higher the magnitude of the convexity value, the greater the slope of the surface

of the population).

Regarding claim 59, Vining et al discloses the method of performing computer assisted

diagnosis, wherein the region of interest includes the aorta and wherein the abnormality includes

abdominal aortic aneurysms (column 3, lines 53-64, refer to blood vessels and airway).

Regarding claim 62, Vining et al discloses a method of performing computed assisted

diagnosis of a region of interest, comprising (Fig. 1, column 5, lines 3-11);

acquiring imaging scan data including at least a portion of the region of interest (column 2,

lines 55-66, images acquired by scanner to select region of interest);

converting the imaging scan data to a volume representation including a plurality of voxels,

at least a portion of the voxels representing a surface of the region of interest (column 6, lines

24-35, the voxels or volume of the segment region of interest are tagged, also column 10, lines

56-65, identifies abnormal thickness and curvature);

analyzing said portion of voxel representing a surface for both a geometric feature

and a local surface texture feature indicative of an abnormality (Fig. 5, column 11, line 51

through column 12, line 17, the convexity is a measure of the direction and magnitude of the

shape of the surface of the population, when the structure is a colon populations with a negative

convexity value are excluded from being considered abnormal (geometric feature), further, only

populations having a positive convexity value above a minimum value are reasonably expected

to be potential lesions (abnormal texture), since cancerous colon masses are generally manifested

by steeply sloped growths, also the higher the magnitude of the convexity value, the greater the

slope of the surface of the population), further (column 5, lines 29-39 two dimensional images

are arranged in computer memory to create a three-dimensional data volume, to create isocubic

volume elements (voxels)).

Regarding claim 71, Vining et al discloses the method of performing computer assisted

diagnosis according to claim 62, wherein the surface is represented as a second differentiable

surface where each surface volume unit has an associate Gauss curvature and wherein said Gauss

curvatures combine to form said geometric features (column 10, lines 48-55, area of curvature).

Regarding claim 72, Vining et al discloses the method of performing computer assisted

diagnosis according to claim 62, wherein a plurality of predetermined geometrical feature

templates are defined and wherein the geometric features of said surface are compared to said

templates to determine a geometric feature classification (column 14, lines comparing the

conventional method by storing surface points (voxels) on the outer surface of the region-grown

object).

Regarding claim 70, recite similar limitation as claim 59 are similarly analyzed.


## Claim Rejections - 35 USC § 103

5.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

6.      Claims 52-58 and 63-69, are rejected under 35 U.S.C. 103(a) as being unpatentable over

Vining et al (U.S. patent 5,920,319) in view of Greensite (U.S. patent 4,991,092).

Regarding claim 52, Vining fails to discloses, "probability density function characterizing

between two voxels". On the other hand Greensite in the same field of medical imaging teaches

the distance between two voxels dependent on the difference in probability, the probability

density of random vector at each point of the signal space (column 15, lines 36-62).

Therefore it would have been obvious to one having ordinary skill in the art at the time of

the invention was made, to modify Vining et al invention according to the teaching of Greensite

because it provides a tone value to each of the plurality of voxels corresponding to the value of

the density function for each of the voxels and displaying each voxel represented by a pixel with

assigned tone value, which can easily be implemented in an image device such as X-ray or CT

device.

Regarding claim 53, Vining et al discloses the method of performing computed assisted

diagnosis, wherein the two voxels are adjacent voxels (Fig. 10e, column 15, lines 22-37, polygon

adjacent).

Regarding claim 54, Vining et al discloses the method of performing computer assisted

diagnosis according to claim 52, wherein intensities of said portion of voxels are used to generate

an estimate of the probability density function (column 6, lines 28-40, an intensity profile along

each vertex's normal vector is calculated to measure x-ray attenuations factor and into the

surrounding tissue until the voxels value).

Regarding claim 55, Vining et al discloses the method of performing computer-assisted

diagnosis, according to claim 54, wherein a plurality of voxel intensities are used to generate a

cumulating distribution function of the region of interest and a local cumulating distribution

function, and wherein the local cumulating distribution function is compared against the context

cumulating distribution function to identify regions of abnormality (column 10, lines 56-65, the

wall thickness values, local convexity values, and local curvature values can be used,

independently or in conjunction (cumulating) with each other).

Regarding claim 57, Vining et al discloses the method of performing computer assisted

diagnosis, wherein the distance is used to assign intensity values to the voxels representing a

surface of the region of interest and wherein said method further comprises displaying said

voxels such that variations in intensity represent regions of abnormality (column 6, lines 33-40,

an intensity profile along each normal vector is calculated, into the surrounding tissue until the

voxel values begin to decrease or increase).

Regarding claim 58, Vining et al discloses the method of performing computer-assisted

diagnosis, wherein the region of interest includes the colon and wherein the abnormality includes

polyps (column 7, lines 10-27, refer to grow an object or polyps).

Regarding claims 56 and 63-65, recite similar limitation as claims 51-54 are similarly

analyzed.

Regarding claims 66-69, recite similar limitation as claims 55-58 are similarly analyzed.

## Conclusion

1.    **THIS ACTION IS MADE FINAL.**  See MPEP § 706.07(a).  Applicant is reminded of

the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this

final action.


## Contact Information

7.      Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Seyed Azarian whose telephone number is (571) 272-7443. The

examiner can normally be reached on Monday through Thursday from 6:00 a.m. to 7:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Bhavesh Mehta, can be reached at (571) 272-7453. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application information Retrieval (PAIR) system. Status information for published application

may be obtained from either Private PAIR or Public PAIR.

Status information about the PAIR system, see http:// pair-direct.uspto.gov. Should you have

questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at

866-217-9197 (toll-free).

Seyed Azarian

Patent Examiner

Group Art Unit 2625

July 28, 2005

DANIEL MIRIAM
PRIMARY EXAMINER